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point; finally a chapter on the teachings of the Bible relative to the subject in hand and another on the present aspects of the theory of evolution in which are considered a number of modern theories as to causes of evolution, inheritance and variation.

These lectures present the evolution idea not from the theological, but from the scientific point of view. They are largely biological in content and spirit though addressed to theologians. The author does not attempt to prove everything, but takes many elementary principles for granted, among them the truth of the entire doctrine of evolution. One is consequently spared the weariness of listening to a labored argument to prove the truth of fundamental ideas, which everybody, except a few immutables, believes. On the other hand it presents in a clear and suggestive way many of the more recent developments of the evolution idea. It does not purport to be an original contribution to knowledge, but it is a valuable and extremely well written book of the 'educational' type.

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#### SCIENTIFIC JOURNALS.

THE ASTROPHYSICAL JOURNAL, AUGUST.

*The New Elements of Clèveite Gas:* By J. R. RYDBERG. In referring to the work of Runge Paschen and regarding the reduction of the spectrum of clèveite gas, the writer recalls the following simple law, announced some time ago by himself: *The difference between the common limit of the nebula and the sharp series, and the limit of the corresponding principal series, gives the wave number of the common first term of the sharp and principal series.* This law holds good to a considerable degree of approximation for the alkali metals Li, Na, K and Rb, which have corresponding triple series, and is proposed as a criterion of the proper *matching* of the subordinate with the principal series. If we denote the principal series by  $P_1$  and  $P_2$  and the subordinate sets by  $S_1$  and  $S_2$ , and assume that  $P_1$  belongs with  $S_1$  and  $P_2$  with  $S_2$ , the law will hold; otherwise, in general, it will not.

In the correspondence chosen by Kayser and Runge the criterion is satisfied within the limits of observational error. The values of the first

terms (in wave numbers, per cm.) of the principal series are as follows:

	Computed.	Observed.	C — O = $\Delta$
Pa	4857.79	4900.65	— 42.86
He	9230.22	8950.14	+280.08

Although the  $\Delta$ 's are well within the limits of error for the observation of this first line, which is in the infra-red and must be measured with the bolometer, there is evidence, in the case of He, of a probable disturbance due to the proximity of Na  $\lambda$  11392.5, the sodium lines being strong in the visible spectrum. The author, therefore, concludes that the computed values of the lines are the most accurate. More accurate determinations of the lines in question will be of extreme value in testing this most interesting law.

Attention is also called to another law due to the writer, which seems to show Parhelium to be of uneven and Helium to be of even valency.

*Outlines of a Theory of Spiral and Planetary Nebulae:* By E. J. WILCZYNSKI. 1. A theory to explain the peculiar formation of spiral nebulae. The writer supposes a mass of nebulous matter to be moving in a circle under the action of a central force. In case the mutual attractions of different parts of the mass upon one another are insufficient to resist distortion, it is shown that the different parts of the mass must be moving in concentric circles, the common center, of course, being the attracting body. Under these conditions it is evident, from Kepler's third law, that those portions of the nebulous mass nearest the center of the circles must rotate faster than those furthest away. In this manner a former radial line in the nebula will be distorted into a spiral.

The writer suggests that this gives us a means of approximating to the age of the nebula (as a spiral).

2. If a nebula has the shape of a flat disc, then the following differential equation exists between  $\rho$ , the density at any point,  $r$ , the distance of the point from the center, and  $\omega$ , the angular velocity of the point, where  $\omega$  and  $\rho$  are both supposed to depend only upon  $r$ .

$$\frac{d^2\rho}{dr^2} + \frac{1}{r} \frac{d\rho}{dr} - \frac{1}{\rho} \left( \frac{d\rho}{dr} \right)^2 + 4\frac{\pi}{c} \rho^2 = \frac{\rho}{c} \left( 2\omega^2 + r \frac{d\omega^2}{dt} \right)$$

If we know  $\rho = f(r)$  we can now solve for  $\omega$ . Assuming  $\rho$  proportional to the brightness, it is suggested that we find by observation

$$\rho = f(r)$$

and the angular velocity of the nebula at any point may be found, except with regard to the constant of integration.

*Hydro-dynamical Investigation of the Solar Rotation:* By E. J. WILCZYNSKI. An application of Lagrange's differential equations for the motion of a fluid, to the case of the sun. Assuming the sun to be gaseous, it is found that the angular velocity of any point within it or upon its surface depends only upon its distance from the axis of rotation, and the distribution of density and pressure within the sun as a whole, *i. e.*, all points on a cylinder with the sun's axis as center revolve with the same angular velocity, but the differential slipping of these cylinders upon one another depends upon the internal conditions of temperature and pressure. If another relation between these three quantities  $\omega$ ,  $\rho$  and  $t$  could be found, the above conditions could be found as functions of the observed law of rotation.

*Researches on the Arc Spectra of the Metals. II. The Spectrum of Titanium:* By B. HASSELBERG. The article is devoted to a consideration of the spectrum of titanium, from  $\lambda$  3450 to D. Our present knowledge of the spectrum rests upon Thalen's work of thirty years ago, and consequently is not accurate as measured by modern standards. Many new lines have been discovered by the author and some of the old ones resolved. Extreme care was taken to eliminate impurity lines. All lines occurring within 0.1 meter of lines catalogued as belonging to other metals were compared with them on the same photographic plate and classified as follows:

A. As belonging to titanium.

(a.) All lines distinctly separated from those of comparison metal.

(b.) Those lines coinciding with comparison lines but having greater intensity.

(c.) Lines exactly coinciding and strong in both spectra (probably belonging to both).

B. As *doubtful*. Lines coinciding, but so feeble in both spectra as to make them possible results of a common impurity.

C. As *impurity* lines, those weak in titanium spectrum and strong in comparison spectrum.

Comparisons with the spectra of Fe, Co, Ni, Cr, Mn, Mg, Zn, Hg, Al, Pb, Sb, Na, K, Cs and Th, served to eliminate many impurity lines. These metals have been investigated by Kayser and Runge, and the comparisons cast doubt upon the legitimacy of some of the lines catalogued as belonging to these elements.

*Minor contributions and Notes*, including 'On a New Method of Preparing Plates Sensitive to the Ultra-violet Rays,' one of the series of articles by V. Schumann.

*Reviews* of recent papers on astro-physical subjects.

#### THE MONIST—OCTOBER.

C. LLOYD MORGAN, in *Animal Automatism and Consciousness*, examines Huxley's and Descartes's views, rejects the theory that consciousness is a collateral product of brain action, and claims for consciousness a rôle of guidance both in the acquisition and utilization of habits, all of which is effected by association and suggestion.

In *The Regenerated Logic*, C. S. Peirce submits to critical examination Ernst Schroeder's great work, discusses the way in which professional opinion is formed, treats of the nature and scope of logic generally, and of 'assertion,' of hypothetical and categorical propositions, and of the quantification of the predicate in particular.

The third article is by E. Douglas Fawcett and is entitled *From Berkeley to Hegel*, being a chapter of the history of philosophy 'embodying a critique of the panlogist phase of idealism.' The treatment is thoroughly speculative in character (the author attempting to resuscitate the Leibnitzian monadology), and hence is the occasion of a reply from the editor, Paul Carus, who, under the caption of *Panlogism*, expounds anew his theories of mind, the soul and immortality.

The concluding article is by George Bruce Halsted, *Subconscious Pangeometry*, and treats of certain mooted points in the history of the theory of parallel lines and of the Non-Euclidean geometry. The usual correspondence follows, with quite a long list of reviews of important publications in philosophy and science.